



**DEPARTMENT of AGRICULTURE
and NATURAL RESOURCES**

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**REVISED RECOMMENDATION OF CHIEF ENGINEER FOR WATER PERMIT
APPLICATION NO. 8742-3, Larry Schmidt**

Pursuant to SDCL 46-2A-2, the following is the revised recommendation of the Chief Engineer, Water Rights Program, Department of Agriculture and Natural Resources concerning Water Permit Application No. 8742-3, Larry Schmidt, 44819 277th Street, Parker SD 57053.

The Chief Engineer is recommending APPROVAL of Application No. 8742-3 because 1) there is reasonable probability that there is unappropriated water available for the applicant's proposed use, 2) the proposed diversion can be developed without unlawful impairment of existing domestic water uses and water rights, 3) the proposed use is a beneficial use and 4) it is in the public interest as it pertains to matters of public interest within the regulatory authority of the Water Management Board with the following qualifications:

1. The well approved under Water Permit No. 8742-3 is located near domestic wells and other wells which may obtain water from the same aquifer. Water withdrawals shall be controlled so there is not a reduction of needed water supplies in adequate domestic wells or in adequate wells having prior water rights.
2. The well authorized by Permit No. 8742-3 shall be constructed by a licensed well driller and construction of the well and installation of the pump shall comply with Water Management Board Well Construction Rules, Chapter 74:02:04 with the well casing pressure grouted (bottom to top) pursuant to Section 74:02:04:28.
3. The combination of diversions under Water Right No. 7457-3 and Water Permit No. 8742-3 may not exceed one cubic feet of water per second per 70 acres irrigated with an annual volume applied not to exceed 2 acre feet of water per acre per year
4. This Permit is approved subject to the irrigation water use questionnaire being submitted each year.

See report on application for additional information.

Eric Gronlund, Chief Engineer
July 21, 2023

Report to the Chief Engineer
Water Permit Application No. 8742-3
Larry Schmidt

Water Permit Application No. 8742-3 proposes to irrigate 160 acres located in the SW ¼ Section 13 at a maximum diversion rate of 1.78 cubic feet per second (cfs) from one well to be completed into the Parker Centerville aquifer (approximately 71 feet deep) located in the SW ¼ SW ¼ Section 13; all in T99N-R54W. The proposed well site is located approximately two miles west of Parker, SD in Turner County.

This well is to supplement the diversion rate of an existing irrigation system. Based on communication with the applicant's operator the full diversion rate of 1.78 cfs is unlikely to be developed solely from this well. The acres for irrigation are also authorized for irrigation by Water Permit No. 7457-3. Water Permit No. 7457-3 appropriates water from two wells located in NE ¼ SE ¼ Section 13 completed into the Vermillion West Fork aquifer for the irrigation of 207 acres SW ¼, S ½ SE ¼ Section 13; all in T99N-R54W at a maximum diversion rate of 2.22 cfs.

Aquifer: Parker Centerville (PAC)

Hydrogeology

A well completion report for a test hole was submitted with this permit application and is summarized in Table 1. Based on the provided information the target aquifer is the gravel from elevation 1321.41 to 1340.41 ft NAVD 88 (ground surface elevation was obtained from the state's 1 meter resolution bare earth digital elevation model).

Table 1: Test hole report submitted with Application No. 8742-3				
Description	From (ft)	To (ft)	From (ft NAVD 88)	To (ft NAVD 88)
top soil	0	3	1392.41	1389.41
clay brown	3	29	1389.41	1363.41
clay blue	29	52	1363.41	1340.41
gravel	52	71	1340.41	1321.41
clay blue	71	118	1321.41	1274.41
chalk grey	118	140	1274.41	1252.41

Hydrologic Investigations in Turner County (Lindgren and Hansen, 1990; Jensen, 2015; Holmes and Filipovic, 2015) did not identify a glacial outwash deposit of sufficient size to map at the location of the proposed well site. Figure 1 shows the location of the proposed well for this application and the first occurrence of aquifer materials for the area from Jensen (2015). A first occurrence of aquifer materials map is typically not a map that identifies individual glacial aquifers. Rather, it is a map of the approximate depth to geologic materials of a mappable extent that have the potential to produce water. In the case of the Parker Centerville aquifer, the first occurrence mapping for Turner County is useful for understanding the aquifer extent, because when present, the Parker Centerville is the first aquifer material encountered (Holmes and Filipovic, 2015). Based on the available data at the time of the work by Jensen (2015), the

uppermost likely water producing geologic material was believed to be the Niobrara Formation (locally referred to by drillers as “chalk rock”). Active water rights/permits and observation wells monitored by the Water Rights Program in the vicinity of the wellsite for this application are also shown in Figure 1. These features are summarized in Table 2, which includes the initially assigned aquifer identification of the water right/permits. Also shown in Figure 1 is the delineation of the Parker Centerville aquifer by Holmes and Filipovic (2015), labeled in Figure 1 as Parker Centerville UR-93 (2015). Figure 2 is showing essentially the same information as Figure 1, but includes the Town of Parker to provide a location reference.

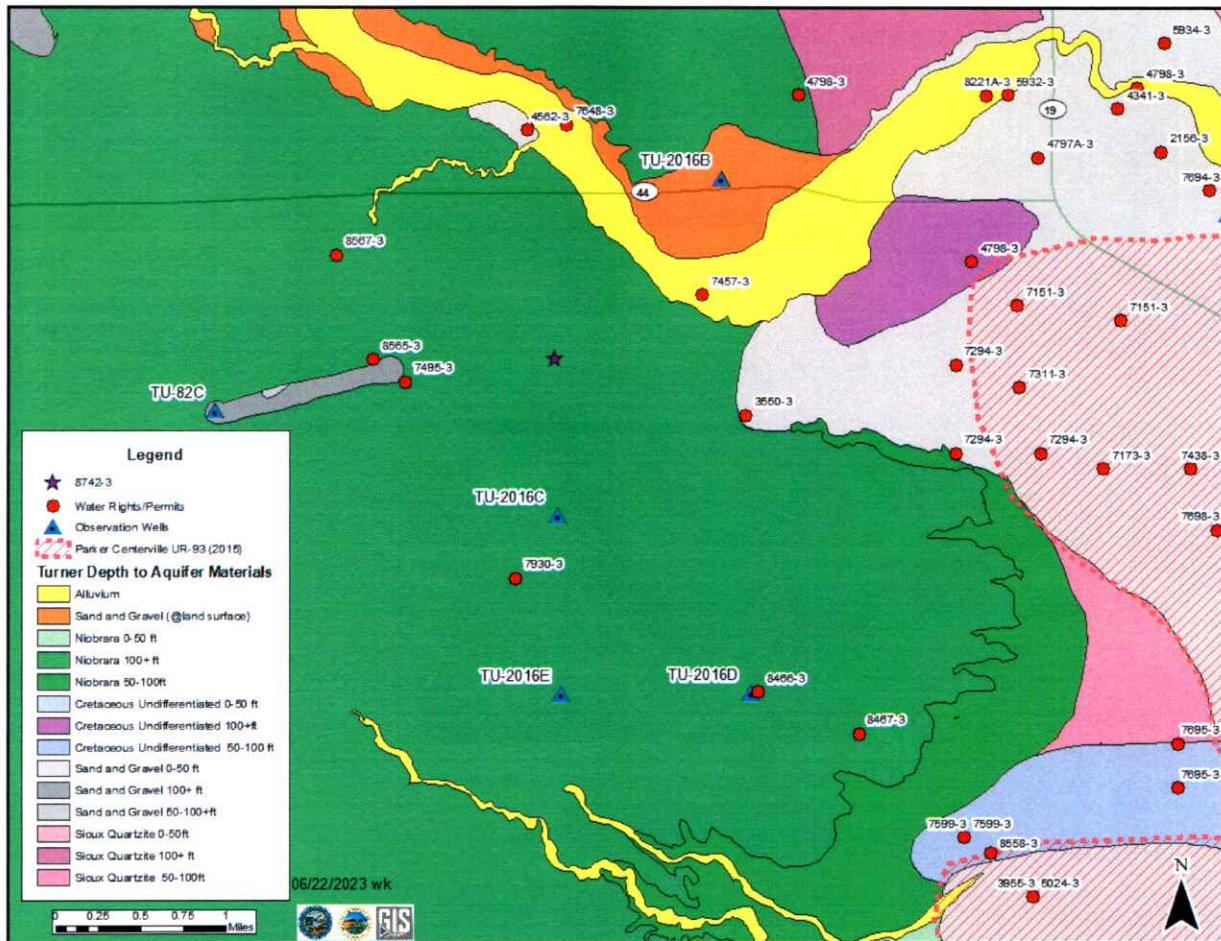


Figure 1: Depth to first occurrence of aquifer materials in the area of the application (Water Rights, 2023B and 2023c; modified from Jensen, 2015; and Holmes and Filipovic, 2015)

Report on Application No. 8742-3

Table 2: Summary of Water Rights/Permits Shown in Figure 1

Permit No.	Last Name	First Name	Priority Date	Status	Aquifer	Use	Rate (cfs)	Acres
2156-3	IHNEN	ROGER	12/02/1974	LC	VWF	IRR	1.28	90
3550-3	SCHMIDT	LARRY L	01/11/1977	LC	VWF	IRR	1.87	132
3955-3	WIRT	BONNIE L	04/19/1977	LC	PAC	IRR	0.87	61
4341-3	WEEG FAMILY FARMS LLP		11/27/1978	LC	VWF	IRR	0.89	62
4562-3	STRAWBRIDGE LIVING TRUST	LAWRENCE R	09/12/1980	LC	VWF	IRR	0.89	74
4797A-3	CITY OF PARKER		06/26/1962	PE	VWF	IRR	0.27	30
4798-3	CITY OF PARKER		08/26/1981	FU	PAC	MUN	0	n/a
5024-3	WIRT	RANDY	07/13/1984	LC	PAC	IRR	0.87	61
5932-3	JO'S FAMILY FARMS LLC		05/02/1996	LC	VWF	IRR	0.7	49
5934-3	VAN DEROSTYNE	JAMES P	05/02/1996	LC	VWF	IRR	1.67	120
7151-3	MERRILL	ALLEN	06/15/2009	PE	VWF	IRR	1.78	320
7173-3	BALLACOSTAIN LLP		12/02/2009	PE	VWF	IRR	1.45	140
7294-3	SCHMIDT	LARRY L	12/19/2011	PE	VWF	IRR	4	456
7311-3	MERRILL	ROBERT	11/28/2011	PE	VWF	IRR	1.33	145
7438-3	DAVIS	JAMES J	09/17/2012	PE	VWF	IRR	1.56	160
7457-3	SCHMIDT	LARRY L	10/09/2012	PE	VWF	IRR	2.22	207
7495-3	HERLYN	DENNIS	11/01/2012	PE	NBRR	IRR	1.11	160
7599-3	RAND	JAMES M	12/28/2012	PE	PAC	IRR	2.22	155
7648-3	PAR MAR VALLEY CNTY CLB		01/17/2013	PE	VWF	IRR	0.89	50
7694-3	PLUCKER	JOSEPH	01/25/2013	PE	VWF	IRR	1.56	33
7695-3	THREE J FARM PARTNERSHIP		02/07/2013	PE	PAC	IRR	1.78	198
7698-3	MERRILL	ALLEN	02/08/2013	PE	PAC	IRR	1.11	145
7930-3	RAND	JAMES M	12/02/2013	PE	PS:U	IRR	1.89	162
8221A-3	SONSTEGARD FOOD COMPANY		08/01/2016	PE	VWF	COM/LCO	0	n/a
8466-3	LEBER BROS LLC		12/23/2020	PE	PAC	IRR	1.78	120
8467-3	LEBER BROS LLC		12/23/2020	PE	PAC	IRR	1.78	140
8558-3	ALLTHATISLEFT LLC		11/04/2021	PE	PAC	IRR	1.78	140
8565-3	HAASE	DUSTIN	12/02/2021	PE	PS:U	IRR	1.11	124
8567-3	HAASE	DUSTIN	12/02/2021	PE	PS:U	IRR	2.22	226

LC-license, PE-permit, FU-future use, VWF-Vermillion West Fork, PAC-Parker Centerville, PS:U-Pleistocene Series: Unknown, IRR-irrigation, MUN-municipal, COM-commercial, LCO-livestock confinement operation

Observation Wells Shown in Figure 1

Observation Well Name	Aquifer	Depth (ft)	Comments
TU-2016B	VWF	22	
TU-2016C	PS:U	155	
TU-2016D	PS:U	163	
TU-2016E	PS:U	155	
TU-82C	PS:U	200	

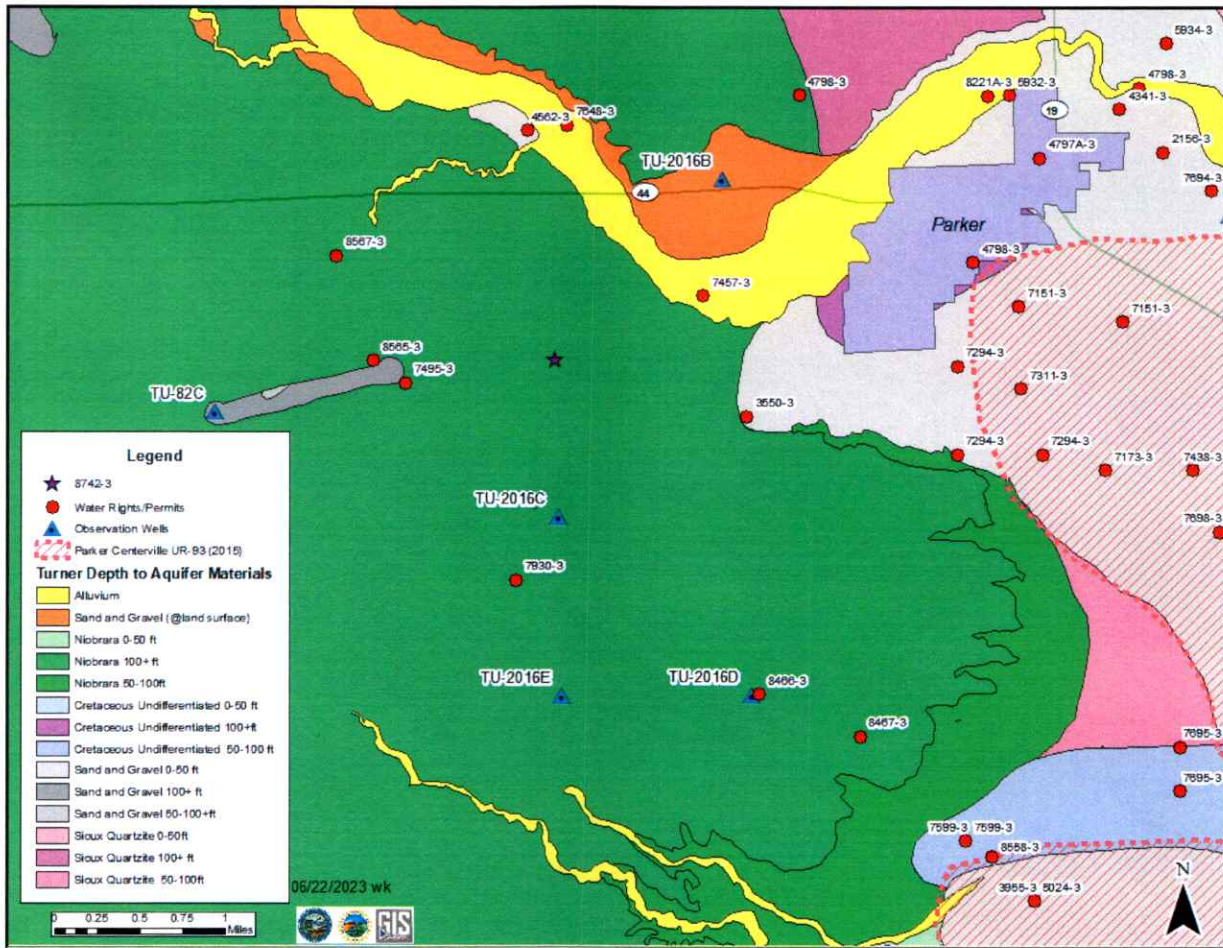


Figure 2: Depth to first occurrence of aquifer materials in the area of the application in relation to Parker, SD (Water Rights, 2023B and 2023c; modified from Jensen, 2015; and Holmes and Filipovic, 2015)

Variations exist between the several historical delineations and interpretations of the aquifers in the Parker area (Water Rights, 2023b; Lindgren, and Hansen, 1990; Hedges et al, 1982; Holly et al, 1993; and Tipton, 1957). The delineation of the Parker Centerville aquifer by Holmes and Filipovic (2015) included an additional area south of Parker that had historically been attributed as either the Vermillion West Fork aquifer or the Parker Centerville aquifer depending on the delineation of the aquifer at the time of the application and the Water Rights staff member reviewing the application (Water Rights, 2023b). This mix of interpretation appears to be due to being in the vicinity of the transition area between the two aquifers (just to the east of Parker, SD) which is an area where the aquifers are in significant hydrologic connection (Holmes and Filipovic, 2015 and Jensen, 2015). Jensen (2015) maps an area southwest of Parker where the first occurrence of aquifer material is sand and gravel at a depth of 0 to 50 feet below land surface west of and adjacent to the northwestern extent (south of Parker) of the Holmes and Filipovic (2015) Parker Centerville aquifer delineation. In reviewing the elevations of the sand and gravel at a depth of 0 to 50 feet below land surface west of and adjacent to the northwestern extent of the Holmes and Filipovic (2015) Parker Centerville aquifer delineation, the elevations of the sand and gravel are

similar. In the area just west of Parker, the elevation change associated with the west bank of the West Fork of the Vermillion River stream valley provides a southern boundary of the alluvium and sand/gravel of the Vermillion West Fork aquifer. This is also consistent with the mapping of the Vermillion West Fork aquifer by the South Dakota Geological Survey (SDGS, 2023b). So, the Jensen (2015) sand and gravel at a depth of 0 to 50 feet area southwest of Parker and adjacent to Holmes and Filipovic (2015) Parker Centerville aquifer delineation will be interpreted as part of the Parker Centerville aquifer. To reflect this, the active water rights/permits that have historically been interpreted as belonging to the Vermillion West Fork aquifer in or adjacent to this area (Nos. 3550-3, 7151-3, 7173-3, 7294-3, 7311-3, and 7438-3) will be interpreted as part of the Parker Centerville aquifer in this report.

Since the work of Jensen (2015) and Holmes and Filipovic (2015), significant additional drilling (both private and state) has occurred in the general vicinity of the well site for this application (especially to the south and west of the well site for this application). This additional drilling has led to information indicating the presence of a more significant deposit of water bearing sand and gravel to the southwest of Parker where Jensen (2015) mapped the Niobrara as the uppermost aquifer material. As additional drilling data has become available in the area and additional water permitting has occurred, the delineation and interpretation of this aquifer has evolved. The two main interpretations for this deposit are Farmer (2021) and Steen (2022). Farmer (2021) mapped a portion of this deposit as an additional area for the Parker Centerville aquifer ranging from approximately two miles south of Parker, SD to 2.5 miles west of Parker. Steen (2022) mapped a portion of this area as a unit of the Pleistocene: Series Unknown (PS:U) aquifer that overlapped with the additional Parker Centerville aquifer area proposed by Farmer (2021). These areas are shown in Figure 3.

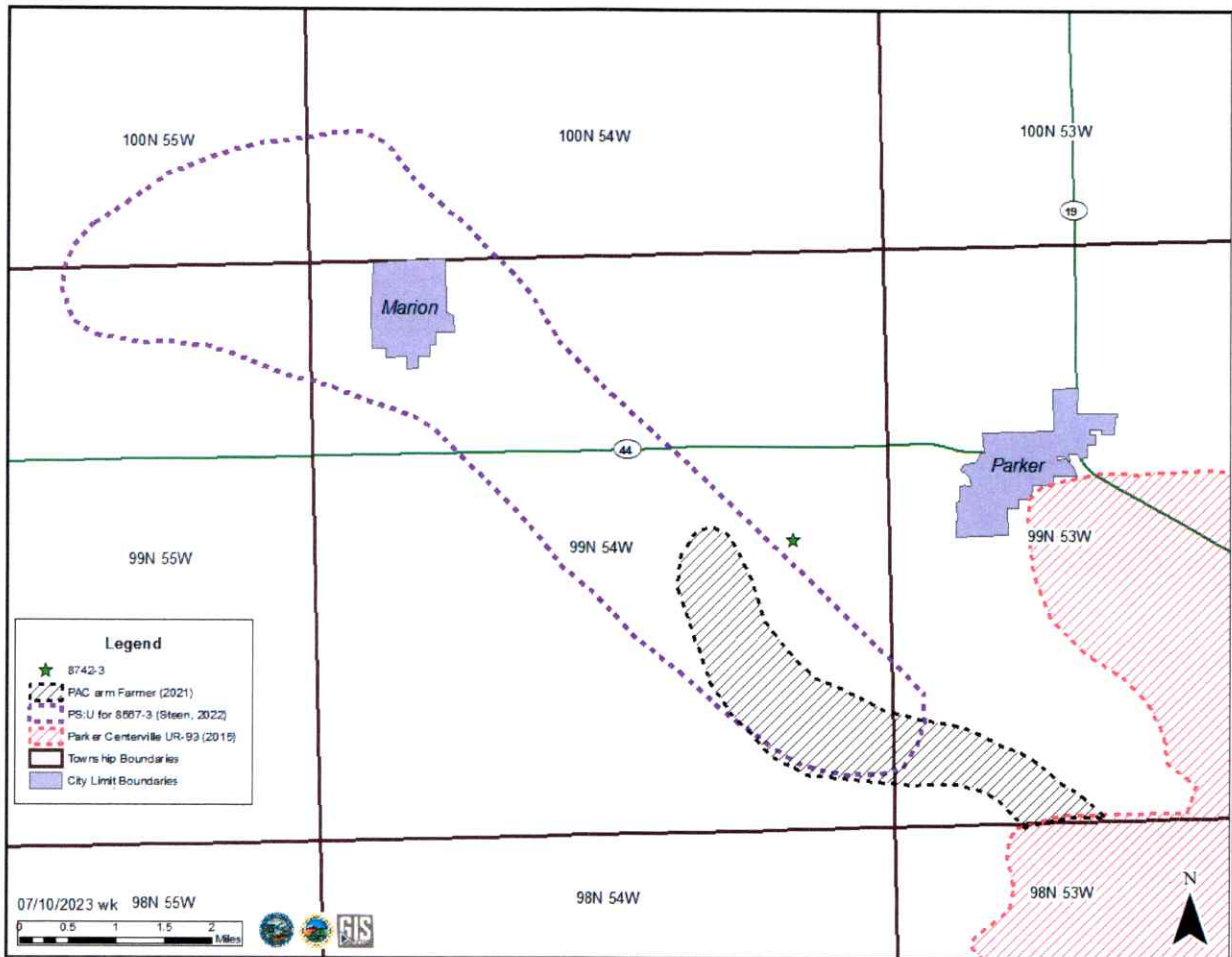


Figure 3: Parker Centerville aquifer delineation of Holmes and Filipovic (2015) (Parker Centerville UR-93 (2023)), Steen's (2022) Pleistocene: Series Unknown aquifer, and Farmer's (2021) arm of the Parker Centerville aquifer

Kilts and Mathiowetz (2023) reviewed the geologic and hydrogeologic information in the area of the overlap using the current and best reasonably available information and resolved the overlap area to be a buried arm of the Parker Centerville aquifer extending northwest from the main body of the aquifer mapped by Holmes and Filipovic (2015). Kilts and Mathiowetz (2023) determined that based-on hydrogeologic properties, such as confined vs unconfined conditions and the amount of overlay glacial till, that only a small portion of the arm mapped by Farmer (2021) should actually be considered as a part of the main body of the Parker Centerville aquifer. The methodology of Kilts and Mathiowetz (2023) is consistent with that used by Hedges et al. (1982) for determining aquifer and management unit boundaries. This area is shown in Figure 4. Given the hydrogeologic properties of the remaining aquifer area, water availability in the remaining area of the aquifer from Farmer (2021) and Steen (2022) will need to be reviewed separately from the main body of the Parker Centerville aquifer (Kilts and Mathiowetz, 2023). Based on Steen (2022) this separate aquifer area is likely nearing full appropriation.

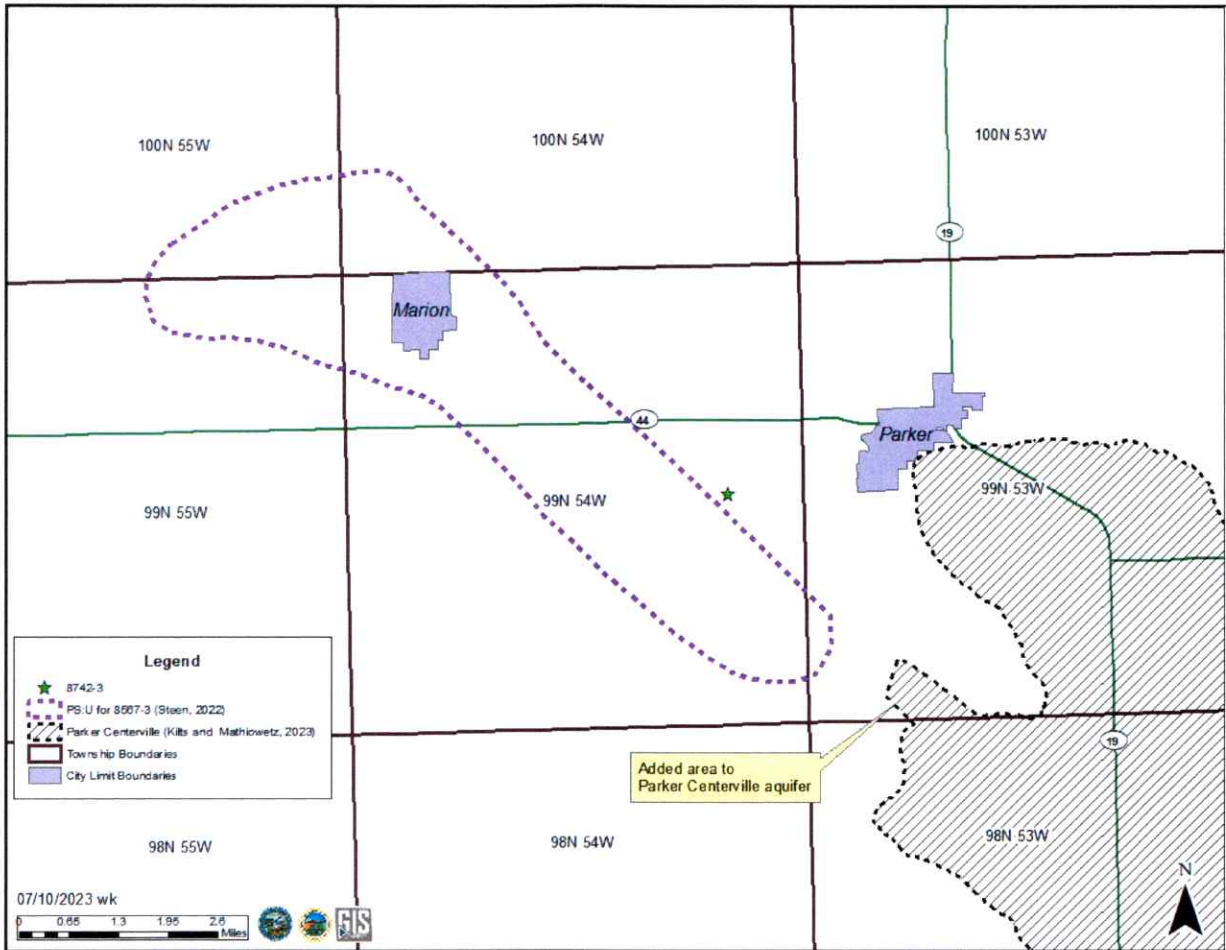


Figure 4: Steen's (2022) Pleistocene: Series Unknown aquifer and Kilts and Mathiowetz's (2023) Parker Centerville aquifer delineation

On June 21, 2023, a site visit was made to the area to survey the casing tops (measuring points) and collect water levels for several wells in the area to gain additional insight into the target aquifer for this application, and if this target aquifer is a westward extension of the main body of the Parker Centerville aquifer or a northeastern extension of Steen (2022). The wells surveyed are shown in Figure 5 and summarized in Table 3. South Dakota Geological Survey (SDGS) well M51-2021-10 is located approximately 0.29 miles south of the well site for this application and is expected to be completed into the same aquifer that this application proposes to utilize. The well for Water Right No. 3550-3 is located approximately 1.13 miles to the east of the SDGS Well M51-2021-10. Based on the water level and elevation of the aquifer materials, there is a high probability that these wells (M51-2021-10, Water Right No. 3550-3, and proposed for this application) are completed into the same aquifer. This information is indicative of the target aquifer for the well site being a westward extension of the main body of the Parker Centerville aquifer.

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Table 3: Data from June 10, 2023, Field Visit					
Well	Aquifer	Top of casing (ft)	Depth to water (ft)*	Water elevation (ft)	Vertical Datum
M51-2021-10	PAC	1415.7	-68.63	1347.07	NAVD88
Well WR No. 3550-3	PAC	1368.77	-34.91	1333.86	NAVD88
TU-2016C	PS:U?	1425.2	-81.29	1343.91	NAVD88
TU-2016E	PS:U	1395.8	-109.49	1286.31	NAVD88
TU-2016D	PS:U	1389.83	-102.65	1287.18	NAVD88
TU-82C	PS:U	1473.27	-25.41	1447.86	NAVD88
M51-2021-09	PS:U?	1447.86	-19.8	1428.06	NAVD88
*depth to water is in reference to top of well casing-a negative indicates below top of casing					
Additional Data					
Well	Aquifer	Depth top of aquifer (ft)	Top of Aquifer (ft)	Bottom of Well or Aquifer (ft)	Vertical Datum
M51-2021-10	PAC	89	1324.66	1313.66	NAVD88
Well WR No. 3550-3	PAC	50	1318.77	1307.77	NAVD88
TU-2016C	PS:U?	116	1307.23	1291.23	NAVD88
TU-2016E	PS:U	123	1271.79	1239.79	NAVD88
TU-2016D	PS:U	93	1296.02	1227.02	NAVD88
TU-82C	PS:U	121	1378.29	1337.29	NAVD88
M51-2021-09	PS:U?	82	1363.97	1349.97	NAVD88

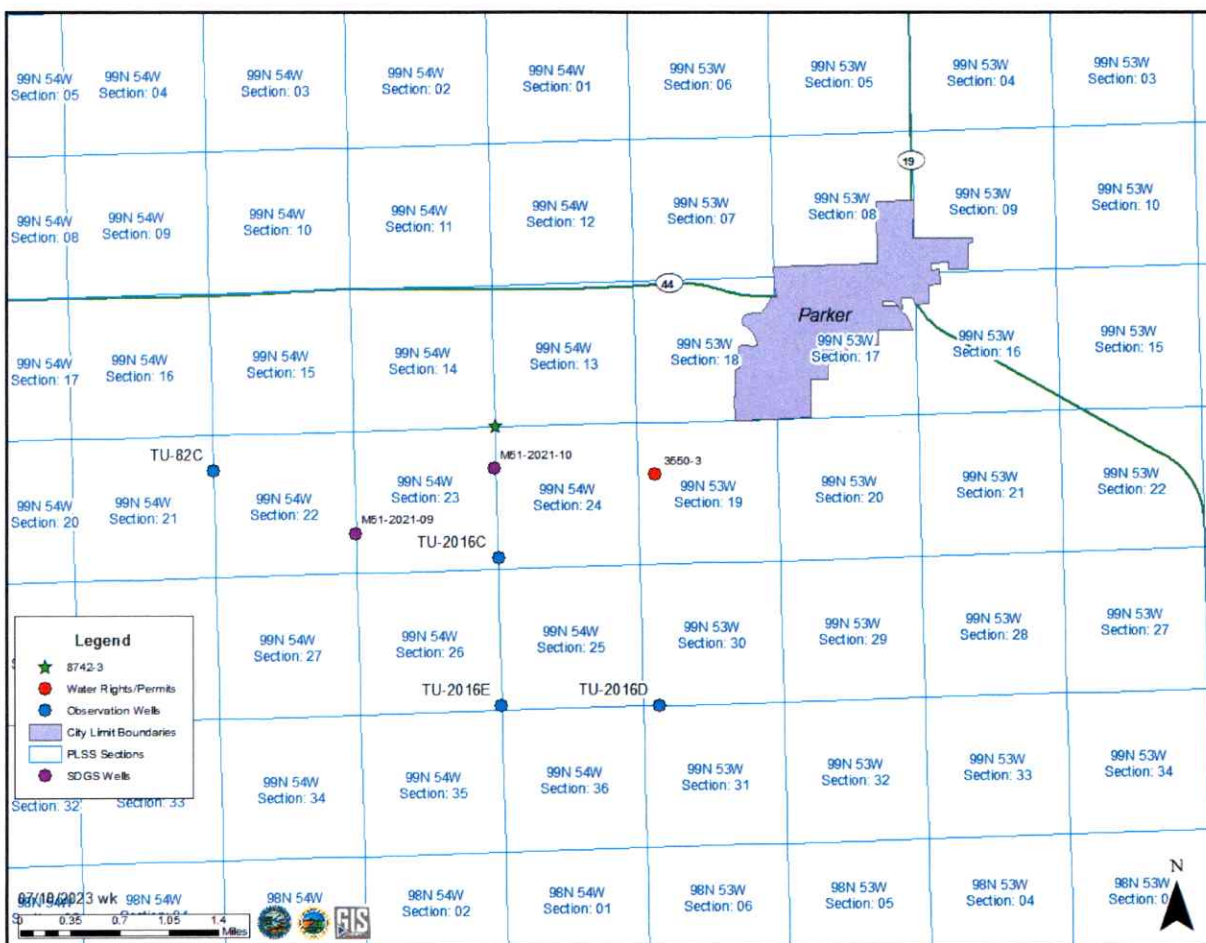


Figure 5: Wells visited for the June 21, 2023, site visit (Water Rights, 2023b and 2023c; SDGS, 2023a)

Several of the Pleistocene: Series Unknown aquifer wells to the south were also examined to determine if the target aquifer for this application should be considered a northeastern extension of Steen (2022). This was in part due to looking at the elevations, the aquifer materials have a slight downward slope going south of the well site for this application. The downward trend was

examined since even with the initial water permit application (No. 7930-3 for James Rand) for the Pleistocene: Series Unknown aquifer; this aquifer was linked in part to a slight valley in the Niobrara bedrock (elevation 1250 feet and lower) mapped by Holmes and Filipovic (2015) (Mathiowetz, 2014). Production wells drilled for water rights/permits in the area of Steen's (2022) Pleistocene: Series Unknown aquifer since Mathiowetz (2014), generally match up with this bedrock valley shown in Figure 6. TU-2016D drilled after the work of Holmes and Filipovic (2015), suggests that the bedrock valley likely extends to the vicinity of TU-2016D (Water Rights, 2023c). The hydrographs of observation wells TU-2016C, TU-2016D, and TU-2016E were also reviewed as shown in Figure 7. Additionally, elevations of aquifer materials and water levels from select production wells completed into Steen's (2022) Pleistocene: Series Unknown aquifer with ground surface elevation were estimated from the state's one meter resolution bare earth digital elevation model as shown in Table 4.

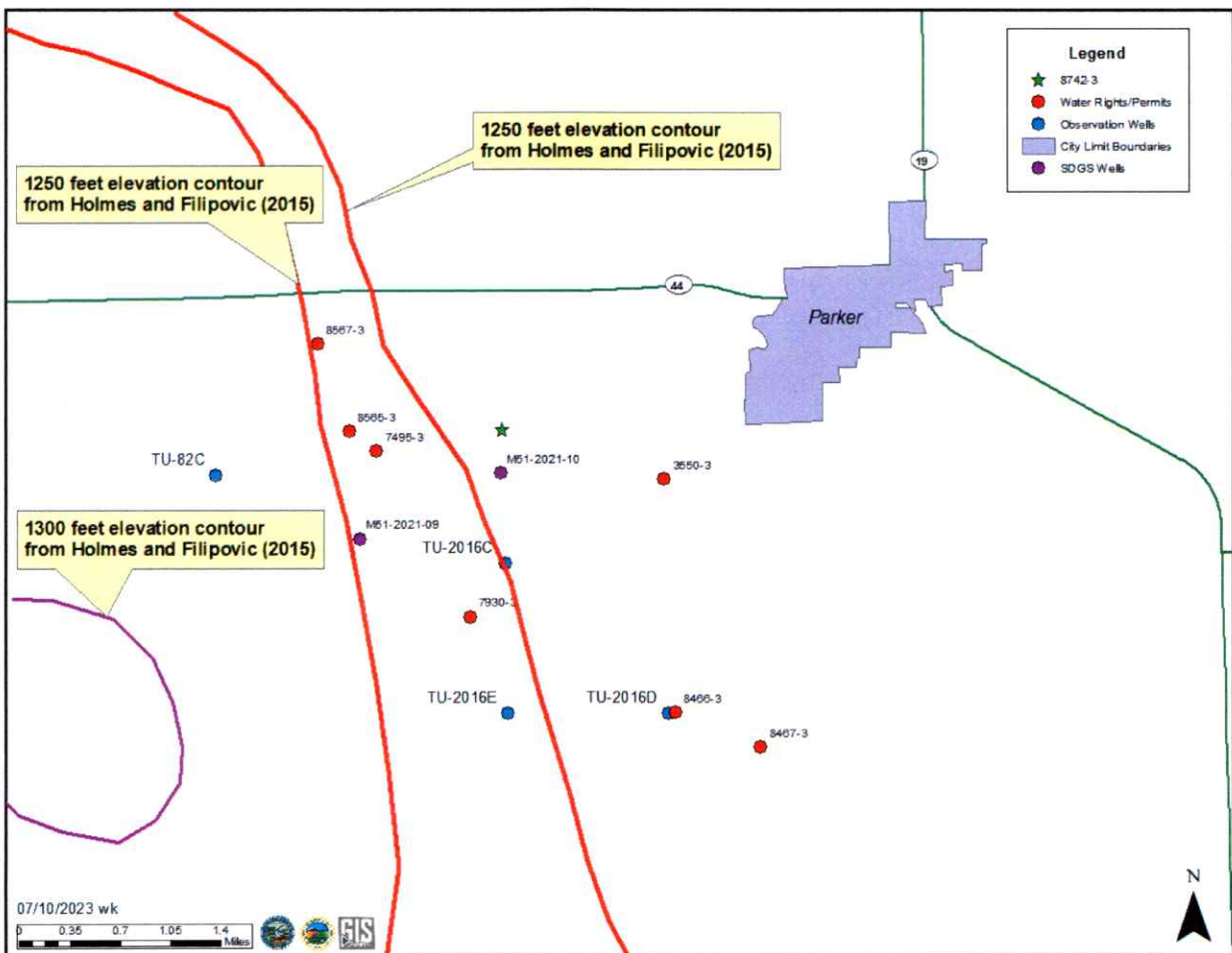


Figure 6: Location of bedrock valley (bounded by the 1250 ft elevation contours) in relation to select observation wells and water rights/permits (Water Rights, 2023b and 2023c, SDGS, 2023a and modified from Holmes and Filipovic, 2015)

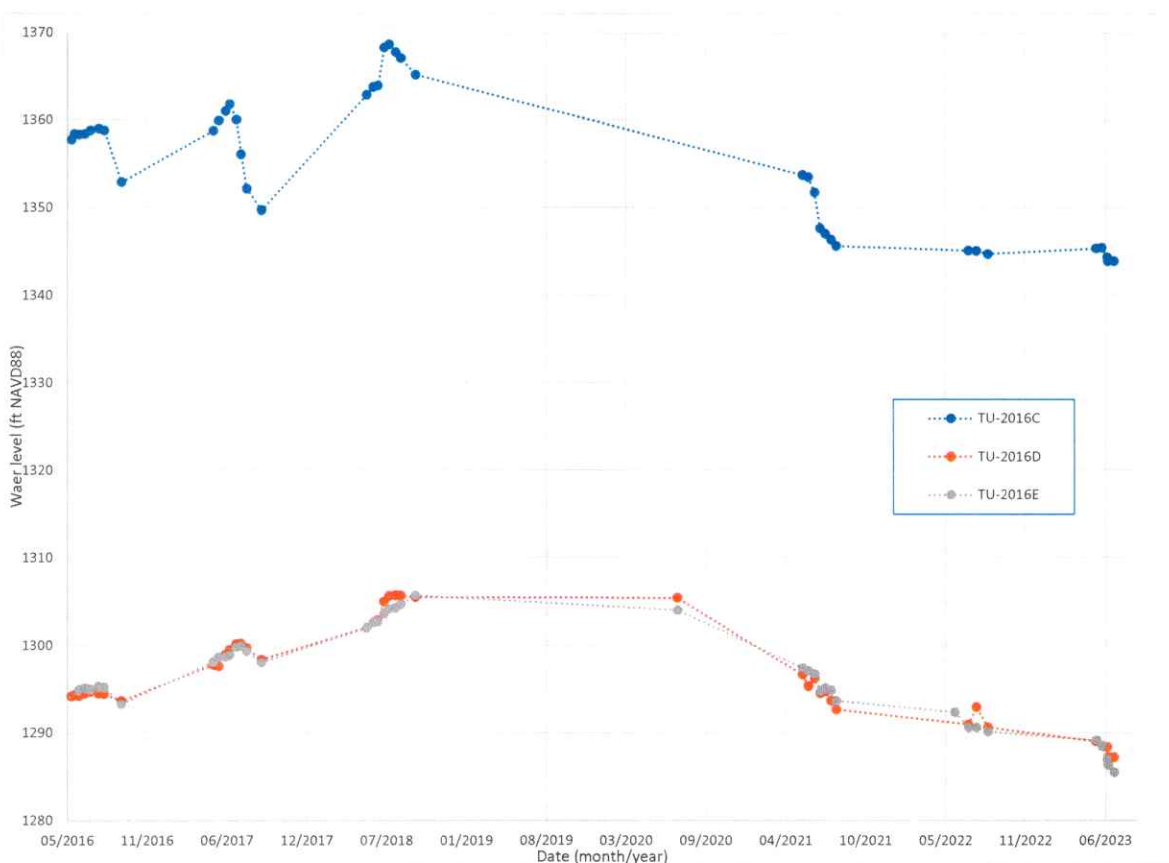


Figure 7: Hydrographs for TU-2016C, TU-2016D, and TU-2016E (Water Rights, 2023c)

Well	Ground elevation (ft)	depth to top of aquifer (ft)	top of aquifer (ft)	depth to bottom of aquifer or well (ft)	bottom of aquifer or well (ft)	Depth to water (ft)	Date	Water level (ft)
7495-3	1449.4	180	1269.4	202	1247.4	150	08/13/2013	1299.4
7599-3	1325.0	33	1292.0	106	1219.0	30	04/26/2013	1295.0
7695-3	1314.3	18	1296.3	47	1267.3	25	07/09/2013	1289.3
7930-3 (pw-2)	1408.5	145	1263.5	168	1240.5	112	11/18/2013	1296.5
7930-3 (ow-1)	1410.9	130	1280.9	193	1217.9	112	05/03/2014	1298.9
8466-3	1386.5	75	1311.5	160	1226.5	not provided	06/15/2021	
8467-3	1364.7	70	1213.7	150	1156.7	not provided	06/16/2021	
8558-3	1313.7	33	1280.7	122	1191.7	27	05/25/2012	1286.7
8565-3	1427.0	174	1253.0	198	1229.0	152	03/29/2022	1275.0
8567-3	1425.7	189	1236.7	208	1217.7	135	03/31/2022	1290.7

All elevations in reference to NAVD88

Wells M51-2021-10 and TU-2016C are located approximately 0.63 miles apart. The elevation of the aquifer materials in M51-2021-10 (1,313.66-1,324.66 ft NAVD88) and TU-2016C (1,291.23-1,307.23 ft NAVD88) and their water levels (Table 3) are relatively close. This suggests that there might be some degree of connection (either direct or separated by a relatively thin amount of till) between the aquifer for this application and Steen's (2022) Pleistocene: Series Unknown aquifer. Additionally, based on the water levels in Table 3, it is likely that discharge via seepage is occurring from the target aquifer for this application to Steen's (2022) Pleistocene: Series Unknown aquifer. Water Permit No. 7930-3 is located approximately 0.44 miles south of observation well TU-2016C and observation well TU-2016E is located approximately one mile south of observation well TU-2016C. Based on Table 3 and Table 4, the water levels at Water Permit No. 7930-3 and observation well TU-2016E are similar, but between observation well TU-

2016C and observation well TU-2016E, there is a difference in elevation of 57.6 feet over a distance of one mile. A gradient like this typically indicates the wells are unlikely to be in the same aquifer. Hedges et al. (1982) has used large drops in the potentiometric surface over short distances as a dividing line between areas for water management between outwash aquifer bodies in contact with each other, for example the Choteau: Tyndall and the Lower James Missouri: Scotland aquifers. Based on the available information (especially water level differences) even if the target aquifer for this application is in contact with the Steen's (2022) Pleistocene: Series Unknown aquifer, there should be a boundary for the purposes of water management in the vicinity of observation well TU-2016C. This is in general agreement with the data from the aquifer performance test done as a part of the review for Water Permit No. 7930-3 which indicated a negative aquifer boundary approximately 3,500 feet from the pumping well for the test (Peschong, 2014). Observation well TU-2016C is approximately 2,600 feet from the well for Water Permit No. 7930-3. Therefore, based on the currently best available information the interpretation of the target aquifer for this application is that it is part of the Parker Centerville aquifer.

Beyond the previously discussed westward extension in the area of Parker, the only additional modification to the Holmes and Filipovic (2015) delineation of the Parker Centerville used in this report is from Mathiowetz (2018). Mathiowetz (2018) extended the mapping of the Parker Centerville aquifer by Holmes and Filipovic (2015) to approximately four miles south of Centerville, SD. This southern extension included a portion of the area mapped as Parker Centerville by Hedges et al. (1982), which contains appropriative and observation wells completed into surficial alluvial and outwash deposits along the Vermillion River (Water Rights, 2023b and 2023c; Jensen, 2003 and 2015). The Holmes and Filipovic (2015) delineation of the main body of the Parker Centerville aquifer with the modifications discussed in this report is shown in Figure 8. For the remainder of this report the term Parker Centerville will refer to the main body of the Parker Centerville aquifer as shown in Figure 8. The areal extent of the main body of the Parker Centerville aquifer as shown in Figure 8 is 44,300 acres.

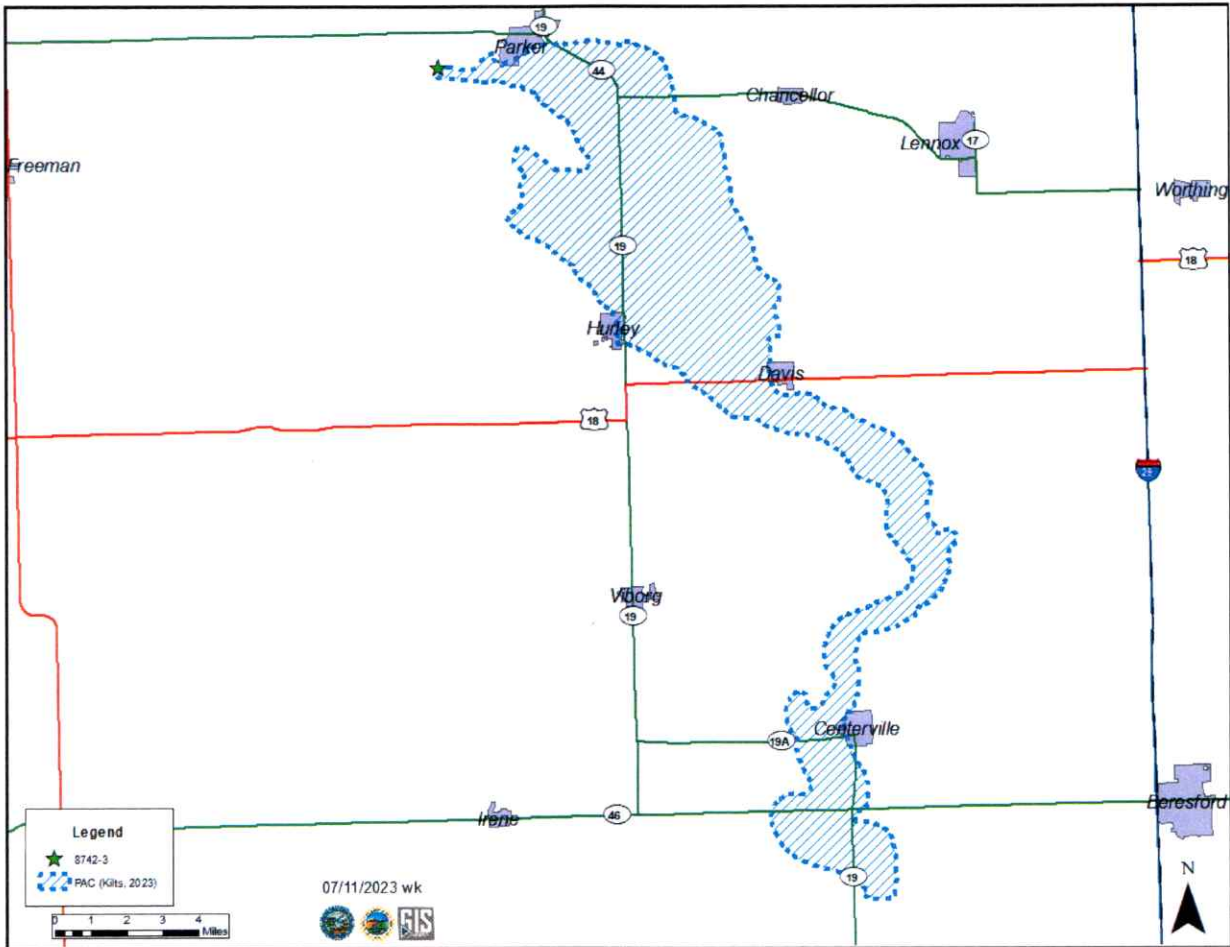


Figure 8: Updated approximate areal extent of the Parker Centerville aquifer for this report (modified from Kilts and Mathiowetz, 2023; Holmes and Filipovic, 2015; Mathiowetz, 2018; Farmer, 2021; Jensen, 2015)

The Parker Centerville aquifer is a predominantly unconfined glacial outwash aquifer, composed of unconsolidated sand and gravel (Holmes and Filipovic, 2015). The north end of the Parker Centerville aquifer is a seven-mile-wide flat depression that narrows down into a mile wide valley train between Davis and Centerville (Tipton, 1957). Holmes and Filipovic (2015) delineated several areas where the Parker Centerville aquifer is hydrologically connected to the Upper Vermillion Missouri aquifer, elsewhere the aquifer can be separated from the underlying Upper and Lower Vermillion Missouri aquifers by a layer of till ranging from 7 to 97 feet thick (Lindgren and Hansen, 1990). The Parker Centerville aquifer is also hydraulically connected to the Vermillion River, Vermillion East Fork aquifer, and Vermillion West Fork aquifer (Lindgren and Hansen, 1990; Holmes and Filipovic, 2015). The thickness of the target aquifer material in the test hole for this application is 19 feet (Table 1), indicating that the saturated thickness of the aquifer in the vicinity of the well site for this application is likely relatively thin. Based on the information for the well for Water Right No. 3550-3 and M51-2021-10 (Table 3) at the well site for this application, the Parker Centerville is locally under confined conditions and may switch to buried unconfined conditions at lower water levels.

South Dakota Codified Law (SDCL) 46-2A-9

Pursuant to SDCL 46-2A-9, "A permit to appropriate water may be issued only if there is a reasonable probability that there is unappropriated water available for the applicant's proposed use, that the diversion point can be developed without unlawful impairment of existing domestic water uses and water rights, and that the proposed use is a beneficial use and in the public interest as it pertains to matters of public interest within the regulatory authority of the Water Management Board as defined by SDCL 46-2-9 and 46-2-11." This report will address the availability of unappropriated water and the potential for unlawful impairment of existing domestic water uses and water rights within the Parker Centerville aquifer.

Water Availability

Water Permit Application No. 8742-3 proposes to appropriate water from the Parker Centerville aquifer for irrigation use. The probability of unappropriated water being available from an aquifer can be evaluated by considering SDCL 46-6-3.1 which requires, "No application to appropriate groundwater may be approved if, according to the best information reasonably available, it is probable that the quantity of water withdrawn annually from a groundwater source will exceed the quantity of the average estimated annual recharge of water to the groundwater source." If the source of the water is older or lower than the Greenhorn Formation and the application is for a water distribution system defined in SDCL 46-1-6 (17), the Board need not consider the recharge/withdrawal issue. The Parker Centerville aquifer is neither older or stratigraphically lower than the Greenhorn Formation and this application is not for a water distribution system as defined in SDCL 46-1-6 (17); therefore, the withdrawal/recharge issue must be considered.

Observation Well Data

In determining the availability of unappropriated water for a permit application, Administrative Rule 74:02:05:07 requires the Water Management Board to rely on the record of observation well measurements, in addition to other data, to determine that the quantity of water withdrawn annually from the aquifer does not exceed the estimated annual recharge.

The DANR Water Rights monitors 22 observation wells completed into the Parker Centerville aquifer, one (TU-56F) of which measurements have been suspended due to the upcoming planned decommissioning of the well (Water Rights, 2023c). The nearest Water Rights' monitored observation wells in the Parker Centerville aquifer to the well site for this application is observation well TU-79A located approximately 4.4 miles to the southeast of the well site for this application and observation well TU-79C located approximately 4.6 miles to the south-southeast of the well site for this application (Water Rights, 2023c). The hydrographs for these observation wells are shown in Figure 9 and Figure 10, these hydrographs are generally representative of the behavior of the hydrographs of other observation wells in the Parker Centerville.

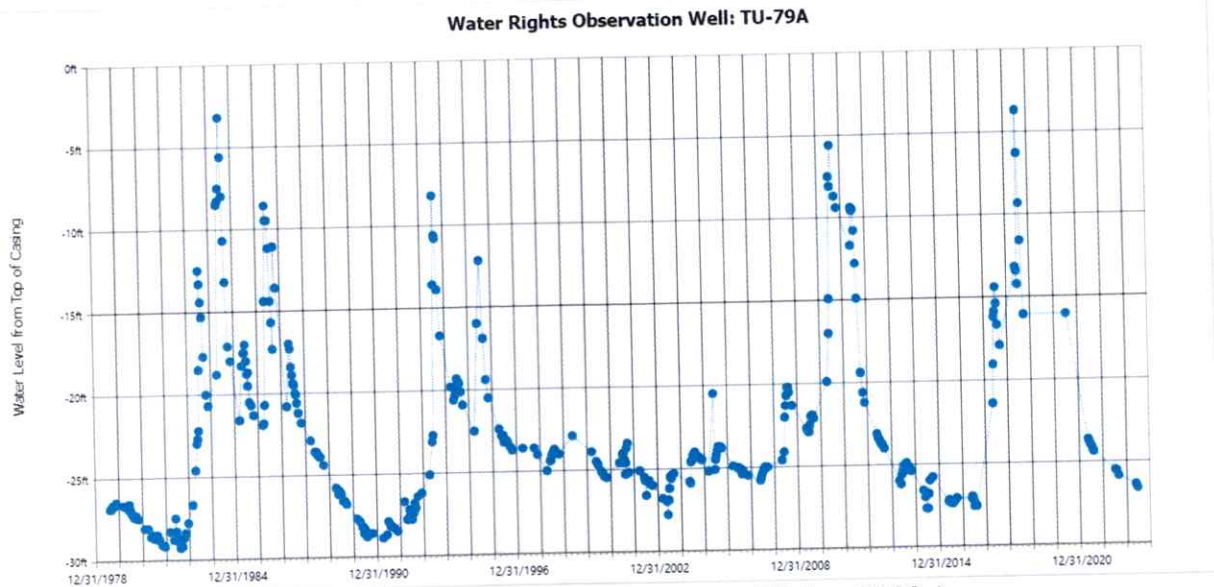


Figure 9: Hydrograph of observation well TU-79A (Water Rights, 2023c)

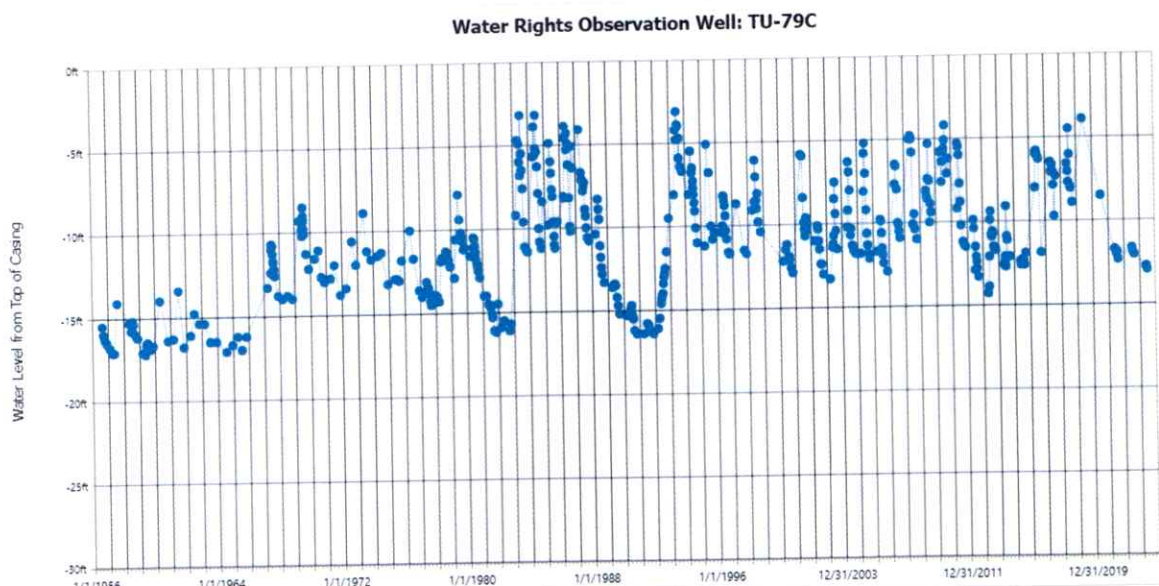


Figure 10: Hydrograph of observation well TU-79C (Water Rights, 2023c)

The majority of the observation wells in the Parker Centerville aquifer have generally stable water levels over their periods of record, with a few observation wells showing a slight decline in recent years (Water Rights, 2023b). The hydrographs for the Parker Centerville aquifer indicate that the aquifer responds well to climatic conditions because water levels are rising during wetter periods (early spring snowmelt and precipitation) and declining to a stable water level during drier periods. The water levels in the observation wells display that the amount of recharge to and natural discharge from the aquifer exceed pumping with the aquifer returning to pre-pumping conditions between irrigation seasons. Aquifer recovery indicates that climatic conditions and therefore, the effects of recharge to and natural discharges from the aquifer govern the long-term fluctuations of waters levels in the aquifer rather than the impacts of pumping from

the Parker Centerville aquifer. By recognizing that both recharge to and natural discharge from an aquifer can be captured for pumping, the observation well hydrographs demonstrate unappropriated water is available for the proposed appropriation.

Hydrologic Budget

Recharge

Recharge to the main body of the Parker Centerville aquifer is received primarily through direct infiltration of precipitation where the aquifer is at or near the ground surface, inflow from the Vermillion East Fork and Vermillion West Fork aquifers, and seepage from the Vermillion River when the water level in the river is higher than the water level in the aquifer (Lindgren and Hansen, 1990). Hedges et al (1985) estimated a recharge rate of 4.9 inches per year for the Parker Centerville aquifer treating the aquifer as an unconfined surficial (non-buried) aquifer. Since the additional area added in Figure 8 southwest of Parker is generally under generally confined to buried unconfined conditions (suggesting that this portion of the aquifer will likely receive a lower average rate of recharge compared to the rest of the aquifer), the Parker Centerville aquifer delineation of Kilts and Mathiowetz (2023) is the best available estimate of the unconfined area of the Parker Centerville aquifer (43,500 acres). Therefore, an area of 43,500 acres and a rate of 4.9 inches per year for the unconfined, non-buried portion of the aquifer will be used to estimate recharge to the Parker Centerville aquifer. This yields an estimated average annual recharge rate of approximately 17,763 acre-feet per year.

Discharge

Discharge from the Parker Centerville aquifer primarily occurs through well withdrawals, outflow to the Vermillion River, leakage to the Upper Vermillion Missouri aquifer, and evapotranspiration in areas where the aquifer is at or near land surface (Lindgren and Hansen, 1990; Holmes and Filipovic, 2015). Near the well site for this application there is likely leakage to the Pleistocene: Series Unknown aquifer of Steen (2022). The majority of water rights/permits for this aquifer are for irrigation use. Due to the relatively low diversion rate of domestic wells and the development of rural water systems over a large portion of the area where the Parker Centerville aquifer is the uppermost aquifer available, withdrawals from domestic wells are assumed to be a negligible portion of the hydrologic budget.

The City of Parker holds Future Use Permit No. 4798-3, which reserves 340 acre-feet of groundwater (less than 100 ft deep) in Sections 7, 8, 9, 15, 16, 17, and 18: all in T99N-R53W (Water Rights, 2023b). Depending on where the well or wells for this permit are eventually developed, groundwater less than 100 ft deep could refer to either the Parker Centerville aquifer, the Vermillion West Fork aquifer, or the Vermillion East Fork aquifer. For the purposes of this hydrologic budget, it is assumed that this future use permit will be fully developed from the Parker Centerville aquifer.

Jensen (2023) in a report dated April 3, 2023, reviewed average annual appropriative use to this aquifer. The best available information indicates there have been no significant changes to estimated average annual appropriative use since this review. Average annual water use by non-irrigation appropriations from the aquifer were estimated at 1,018 acre-feet per year (Jensen, 2023). Jensen (2023), to reflect the current development of irrigation water rights/permits more

accurately, used the average annual reported water use on irrigation questionnaires for irrigation water rights/permits from the Parker Centerville aquifer from 2012 to 2021 (approximately 10,772 acre-feet per year) and estimated one foot of water per acre per year of use for recently issued irrigation water permits that have not yet reported water use (1,113 acre-feet per year). For Water Right/Permit Nos. 3550-3, 7151-3, 7173-3, 7294-3, 7311-3, and 7438-3, Jensen (2023) estimates average water use based on reported use from 2012 to 2021 at 485 acre-feet per year. This results in a total estimated average annual withdrawal rate for the irrigation appropriations of 12,370 acre-feet per year (Jensen, 2023 and Water Rights, 2023e). Using the same rate of one foot of water per acre per year of use, water use associated with this application for irrigation is conservatively estimated at 160 acre-feet per year.

Summary

Estimated average annual recharge to the Parker Centerville aquifer is approximately 17,763 acre-feet per year. The estimated average appropriative withdrawal rate from the Parker Centerville aquifer totals to approximately 13,888 acre-feet/year; (non-irrigation: 1,018 acre-feet per year; future use: 340 acre-feet/year; irrigation: 12,370 acre-feet per year; and this application: 160 acre-feet per year). Based on the hydrologic budget, there is a reasonable probability unappropriated water is available from the Parker Centerville aquifer for the proposed appropriation, which is supported by the review of observation well data for the aquifer.

Potential for Unlawful Impairment of Existing Water Rights

Water rights/ permits in the vicinity of the well site for this application are shown in Figure 1 and summarized in Table 2. The nearest water right/permit to the well site for this application completed into the same aquifer is Water Right No. 3550-3 located approximately 1.1 miles to the east-southeast held by the applicant, Larry Schmidt, for irrigation (Water Rights, 2023b). The nearest water right/permit to the well site for this application likely completed into the same aquifer not belonging to the applicant is Water Permit No. 7311-3 located approximately 2.7 miles to the east held by Merrill Robert for irrigation (Water Rights, 2023b). There are no domestic wells on file with the Water Rights Program within one mile of the well site for this application completed into the Parker Centerville aquifer based on well locations identified on the report filed by the well driller; However, there are likely closer domestic wells completed into the aquifer not on file with the Water Rights Program. During the site visit, the applicant's operator noted there was a domestic well at an old farm site approximately 0.25 east of the proposed well site for this application (Leber and Schmidt, 2023).

In general, this aquifer is under unconfined conditions, but in the vicinity of the well site for this application, the aquifer can be under locally confined (or artesian) conditions. The Water Management Board has promulgated rules that allow water to be placed to maximum beneficial use without the necessity of maintaining artesian head pressure for domestic use. The Board has defined an adversely impacted domestic well as "a well in which the pump intake was set at least 20 feet below the top of the aquifer at the time of construction or, if the aquifer is less than 20 feet thick, is as near to the bottom of the aquifer as is practical and the water level of the aquifer has declined to a level that the pump will no longer deliver sufficient water for the well owner's needs." In the case of Water Permit Application No. 2313-2 for the Coca-Cola Bottling Company of the Black Hills the Water Management Board adopted findings that noted that if the increased costs

or decreased production as a result of the impacts of legitimate users on artesian head pressure could be considered an adverse impact it would conflict with SDCL 46-1-4 (Water Rights, 1995). SDCL 46-1-4 requires the water resources of the state be put to beneficial use to the maximum extent of which they are capable (Water Rights, 1995). There is not a history of recent substantiated well interference complaints in the Parker Centerville aquifer in Turner County (Water Rights, 2023d).

In the area of the proposed location for the well for this application, the Parker Centerville aquifer can be relatively thin with a limited amount of saturated thickness. While long term average annual withdrawals would not exceed average annual recharge to the aquifer, short term conditions may occur when withdrawals exceed recharge. When this occurs, water will be removed from storage, consequently reducing the saturated thickness of the aquifer. If this occurs for an extended period of time such that the saturated thickness is reduced to the extent that the water rights/permits can no longer pump at their developed or "historically established" rates, this may be considered an adverse impact. The greatest potential for this to occur is between the pumping well for this application and the nearby edge of the aquifer. However, there are no domestic wells on file with the Water Rights Program between the proposed well location and the aquifer boundary. If short term conditions occur when withdrawals exceed recharge, the water source would need to be managed to prevent any unlawful impairment. Since the nearest appropriative well in this aquifer belongs to the applicant; it is in the applicant's best interest to manage his own wells so they do not impact each other, which should in turn limit impacts on other nearby wells in the Parker Centerville aquifer. Given the lack of well interference issues, the need for the applicant to manage their withdrawals so as not to impact their own wells, and the lack of domestic wells competed into the Parker Centerville aquifer on file with the Water Right Program in the area, there is limited potential for unlawful impairment of existing users with adequate wells.

In 2021, the SDGS installed an observation well M51-2021-10 approximately 0.3 miles south of the proposed well site for this application. Observation well M51-2021-10 is completed into the same aquifer that this application proposes to utilize. Out of an abundance of caution it recommended that this observation well be measured as part of the DANR Water Rights Program Observation Well Network for at least the first several years of pumping under this application, if approved.

Conclusions

1. Water Permit Application No. 8742-3 proposes to irrigate 160 acres located in the SW $\frac{1}{4}$ Section 13 at a maximum diversion rate of 1.78 cfs from one well to be completed into the Parker Centerville aquifer (approximately 71 feet deep) located in the SW $\frac{1}{4}$ SW $\frac{1}{4}$ Section 13; all in T99N-R54W.
2. Based on observation well data and the hydrologic budget, there is a reasonable probability that unappropriated water is available from the Parker Centerville aquifer to supply the proposed appropriation.

3. There is a reasonable probability that the diversion by Water Permit Application No. 8742-3 will not unlawfully impair adequate wells for existing water rights/permits or domestic uses.
4. It is recommended that South Dakota Geological Survey Well M51-2021-10 be added to the DANR Water Rights Program Observation Well Network.



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